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ABSTRACT

An evaluation of an individualized program for ninth-grade algebra and basic mathematics students is presented. Objectives of this program were to increase achievement and to create a positive attitude toward mathematics. Materials written for the program were used with audiovisual lessons recorded on tape cassettes. When the achievement gains of the 31 experimental students were compared to students in the regular classes, no significant differences were found. It was noted that not all of the experimental students had completed 36 weeks worth of instruction at the time achievement gain was assessed while control-group subjects had. The experimental group did display a more positive attitude toward mathematics after one year's exposure to the program. Included in this report are details of the program management, equipment, facilities, budget statements, a needs assessment report upon which the program is based, summaries of achievement gains, and the analysis of the attitudinal measure. The needs questionnaire and the attitude questionnaire used are given in full. This work was prepared under an ESEA Title III contract. (JP)

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July 31, 1973

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E. S. E. A. T I T L E III
Project Video-Tape Packages Mathematics

Submitted to:

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SE 017 207

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SUMMARY

The Arnold video-tape programmed mathematics project had two main objectives for 1972-73; (a) to raise the mathematical achievement level of those participating in the VTPM program by 5 - 10 percentile points when compared to those not in the program; and (2) to have those students participating in the VTPM program display a more positive attitude towards mathematics. These objectives were determined by a comprehensive needs assessment conducted in the Arnold area that included a questionnaire, meetings, and interviews with students, faculty members, citizens, and the school board. Also important evidence that related to the establishment of the above stated objectives was gained from state priorities, local school administrators, and a state-wide SRA assessment survey.

The program in 1972-73 was conducted in School District #89, Arnold, Nebraska, a K-12 district serving 180 elementary and 207 secondary students. During the school year, 1972-73, 31 ninth grade students participated in the VTPM program. The writing, production, and implementation of the Arnold program was conducted by two local high school instructors, Russell Thompson and Albert Fuller, who in turn comprised the project staff.

The 31 ninth grade mathematics students (experimental group) were exposed to the VTPM program. Within this group there existed two sub-groupings or classes; the basic mathematics and the algebra classes. These two classes in the experimental group proceeded at different paces during the school year. For evaluative purposes, three instruments were selected. To evaluate the attitudes of the students toward mathematics, the Mathematics Inventory (Minnesota Test Publishers, St. Paul, Minnesota) was utilized.

To measure the achievement levels, the Mathematics Test, grades 7 - 9 (Houghton Mifflin) was employed in the basic mathematics class, while the Lankton First-Year Algebra Test (Harcourt, Brace, & Jovanovich) was used to evaluate the algebra students. The control group that was necessary for comparing achievement levels was selected from the previous year's ninth grade group. Thirty-six students made up this group.

In comparing the algebra groups, it was found that the experimental and control groups scored almost identically. It is interesting to note, however, that none of the experimental group had completed thirty-six weeks of algebra instruction as had the participants in the control group. In analyzing the basic mathematics groups, the control group's average score decreased from 47.90 to 46.20 while the experimental group's average increased from 43.83 to 46.17. The t-test was also employed in analyzing the significance of the means of the two groups, and these results are shown in great detail in the narrative of this report. It was also noted that those students who had completed more than twenty weeks of instruction in the VIPM program when compared to the total control group scored significantly higher (30.5 compared with 26.9). In terms of mathematics achievement, the VIPM concept proved to be worthy.

In regard to the second major objective of the program, improving attitudes toward mathematics, the VIPM students did display a more positive attitude towards mathematics after one year's exposure to the program. Sixty-five per cent of the students showed a gain of a more positive attitude which far exceeded the stated level of 50% in the objectives of the VIPM program.

The success of the Arnold VIPM program justifies the recommendation that the program be continued to inclued the four-year target group of the VIPM project, all of the students in the Arnold High School.

FINAL EVALUATION REPORT

Arnold, Nebraska

E. S. E. A. Title III Project

The Locale

Arnold Video-Tape Packages Mathematics is located in the Arnold Public Schools, District #89, located in Custer, Logan and Lincoln counties in Nebraska. The population of the area served by this project according to the 1970 census is 1,421 persons. The population of the state is approximately 1,468,000.

Arnold Public Schools is a K-12 School District serving 246 elementary and 140 secondary students. The assessed valuation of the district is $10,691,964. Currently the school district is levying 35.90 mills or approximately $1,000 per student to finance the schools.

The school is accredited as an "A" school by the Nebraska State Department of Education.

Farming and ranching operations provide the economic base for the Arnold area.

Needs Assessment

In order to determine what the needs and priorities were at the local level, a questionnaire (see questionnaire appendix I) was develped and used as part of four special meetings. Meetings were held with students, faculty members, citizens committee and school board. As a result of these meetings, certain priority areas were agreed upon by a majority of the groups. These included the need to provide for individual

instruction in order to have more continuous learning for each student. There was also the need for programs for the exceptional child-- poor achievers and high achievers. In addition there was the need to try new and innovative programs for curriculum improvement, and the necessity to improve the extent of our educational accountability.

On the state level, priorities were assessed by discussions with Boy's State and Girl's State representatives, by reading news items, by interview with educational leaders from all parts of the state, and from the Nebraska State Department of Education needs assessment. For the most part, the local priorities agree with the state priorities. The principle additions whould be a need for self-motivation and direction and the involvement of lay people in educational planning.

The needs that were expressed the greatest number of times by all contacted groups ranked in order of priority were:

1. Individualize instruction.
2. Educational accountability.
3. Programs for low achievers.
4. Continuous learning.
5. Curriculum improvements.
6. Innovative changes.
7. Programs for high achievers.

These were arrived at by comparing needs as expressed by local students, educators and citizens; by review of school board actions and policies; by review of recent legislative action, and State Department needs assessment; by Boy's State and Girl's State reports; by interviews with persons from all parts of the state and educational leaders from other states; and by consultation with local superintendents.

The state-wide SRA assessment survey indicated that Arnold ninth grade students ranked six percentile points below the state norm in mathematics. (See SRA table, Subjective Evidence of Need, appendix II).

An interview with the head of the high school math department revealed that some graduating seniors who had met the graduation requirement of taking two years of mathematics and who scored near the fiftieth percentile on ITED math tests were unable to calculate the total cost of the graduation announcements they had ordered. Regardless of percentile rank such a student does not have the math competencies necessary for the most elementary business transactions used in everyday life.

The junior high math instructor said of our math program: "I think our present math program squelches the advanced student and as a whole our high school students do not appear to be as advanced as their metropolitan peers. Under our present program, it is absolutely impossible to teach 34 students on an individual basis. I definitely feel that there is a dire need for some form of individualized instruction in our math program if we are to help the slow learner progress and the advanced student meet his potential."

The general math instructor (Remedial Arithmetic) found that he had as many different kinds of math deficiencies in his classes as he had students and that general math had degenerated into a "teach one while the rest wait their turn" situation. A new approach was necessary.

Upon interviewing Superintendent Alvin Story and listing the needs of the school as perceived by him, it was found that those needs related to the above listed priorities as follows:

Needs of district as perceived by Superintendent	Priorities Illustrated
1. A resource center.	1. Desire to use new techniques.
2. A program for under-achievers of a corrective nature.	2. Establishing programs for the under-achiever. Individualizing instruction.
3. Teaching aids of the motivating nature.	3. Desire to use new materials.
4. A structured continuous progress curriculum.	4. Individualize instruction-continuous learning.
5. A coordinator for better public relationship between teachers and parents.	5. Provide ways and means whereby parents of school children may be informed of goals, etc.
6. Help for the emotionally disturbed students and teachers.	6. Strengthen and extend program for exceptional children.
7. More vocational subjects which give proficiency in a given service area. There is a need for actual performance experience.	7. Establish special programs for the non-academic achievers, and curriculum improvements.
8. Teachers need help in maintaining proper rapport of conduct nature with their students during class time.	8. Provide both pre-service and in-service programs for increasing and developing.

High school mathematics was selected as the area of concentration for the project and for developing a plan for a program which would raise the class norm to the average for the State of Nebraska as the objective. In other words, the objective of the proposed project was to raise the math norm by at least six percentile points in four years of high school and also to raise the performance of each student significantly. It was felt that this was a realistic, if not modest, goal for the proposed project.

Conception of the program

Two Arnold High School Teachers, Albert Fuller and Russ Thompson, conceived the idea of the project. Once the community and school needs assessment was completed, a committee of community members was organized to make certain that the members of the community were aware of these needs. The minutes of this first meeting, held on February 3, 1971, are as follows:

1. History of the evolution of the idea for the project was given by Mr. Fuller.
2. A description of the project as presently conceived was presented by Mr. Thompson.
3. A general discussion of the project was held with the following opinions expressed.
    a. Mr. Don Flint expressed the opinion that such a project might have helped him in school as he had been forced, because of scheduling problems to take Algebra with a class composed mostly of students in high grades and had been unable to keep up. He eventually got to the place where it was hopeless and gave up.
    b. Mrs. Peggy Croghan expressed the opinion that she wished that the project had been in operation when her oldest son was in school. He was an above average math student and she felt he could have progressed farther and achieved more with the project system than with the old system.

c. Mr. Bill Conner expressed the opinion that the project sounded good to him because, "One picture is worth a thousand words."

d. Mrs. Ruth Conner expressed the opinion that the project sounded like a good idea to her.

e. Miss Margaret Aydelotte expressed the opinion, among others, that the program would have to be applied in all subjects in the school to make it work, that teaching a student how to read a textbook properly to get information from it is more important, etc. Miss Aydelotte is our chief critic and the only one present who seemed to have reservations as to the feasability of the project.

f. Mrs. Kathryn Romans asked detailed questions as to the operation of the project, seemed satisfied that the project was a good one, expressed the wish that her son had been in such a program when he was in school, and left with the remark, "I'm glad to know that our teachers are interested in seeing that our children learn as much as possible.

g. Ken Wehrman and Bert Fochtman expressed approval and support the idea.

4. A short description of what is meant by priorities and needs was then made by Mr. Fuller and a discussion followed. Papers on which priorities and needs could be expressed were handed out. Most committee members took them home to consider.

5. The meeting adjourned. We felt that the discussions were valuable and informative and, if nothing else was accomplished, a good relationship was established between the committee and the project staff.

MEMBERS OF COMMUNITY COUNCIL

Bert Fochtman - President of Rotary Club (farmer)

Donnell Flint - President of Chamber of Commerce (service station owner)

Ken Wehrman - Master of Masonic Lodge (Vice-President of bank)

Margaret Aydelotte - Retired teacher (farm operator)

Ruth Conner - Teacher in another district but a resident of this community

Mrs. Clarence Romans - Parent of students (housewife)

Bill Conner - Parent of students (Implement dealer and farmer)

Peggy Croghan - Parent of students (Operator of sundry store)

Carla Ahrens - Student

Pamela Holman - Student

Alvin Story - Superintendent of Schools

Russ Thompson - Teacher

Darrell Peters - College graduate (farmer)

Miles Auble - Student

Albert Fuller - Teacher

Another session of the Arnold Community Council was held on May 19, 1971.

The meeting was called to order by staff member Albert Fuller. Council members that were present are as follows: Superintendent Alvin Story, Project Director Russell Thompson, Assistant Director Albert Fuller, Council members Bert Fochtman, Darrell Peters, Margaret Aydelotte, and Ken Wehrman.

An update on the math project activities was given by Albert Fuller. Following the update, Mary McManus, Title III state consultant, explained the history and purpose of the Title III. She also explained the function of the Community Council.

The members of the Council directed questions to Miss McManus which clarified the relationship between the school district, the Title III project and Title III office. It was decided that an application should be made for a planning grant. It was pointed out that if the planning proposal was accepted the committee would need a chairman and a secretary. It was decided to hold the next meeting after the proposal had been accepted or rejected by the state advisory committee.

The planning proposal was approved and funded by the Title III Office of the Nebraska State Department of Education. During the 1971-72 school year under the planning grant, the project staff created the operational proposal.

Scope of the Program

The four-year target group of the VTPM project was all of the students in the Arnold High School. The one year target group is ninth grade.

Obviously, since the program was sequential, it must start with the lowest level of students included in the entire four-year target group and each year one class will be added to the program until, four years from now, all students in the Arnold High School will have the opportunity to participate. The entire ninth grade for the first year of operation was chosen because it is a requirement in Arnold High School that Freshmen enroll in a mathematics course. The high school level instead of some other level was selected because the ninth graders were mature enough to handle the type of program envisioned. Also, the beginning year of high school is a feasible time to take stock of one's achievements, re-organize and correct deficiencies before proceeding.

The student participants in the project were 31 ninth grade students in the Arnold Public Schools.

There were two primary objectives for the project. These were:

1. At the end of one year ninth grade students who participated in the VTPM program in Basic Math I and Algebra I would have achieved 5-10 percentile points greater growth than the control group on an achievement test.

2. At the end of one year, at least 50% of ninth grade VTPM students in Basic Math I and Algebra I would have gained a more positive attitude toward mathematics as measured by an attitude scale.

The Staff

All persons necessary for the operation of the first year of the project were contacted and interviewed, their respective duties explained to them and their prospective salaries proposed to them. They indicated a willingness to accept the positions.

The project director had the responsibility for observing all time requirements, hiring all personnel, presenting requests for all materials, equipment, alterations and other items of expense to the principal for approval, meeting the requirements of E.S.E.A., Title III and directing the activities of the project teachers.

To accomplish these activities, he had to be an effective administrator.

The project assistant director was assigned the responsibilities for the activities involving the community council, dissemination correspondence, writing of the packages, the production of the video-tapes and the maintenance of equipment.

To accomplish these activities, he also had to be an effective administrator.

The director and assistant director also spent much of their time acting as curriculum developers, teachers and disseminators. In these capacities they needed to be well informed about materials and techniques of mathematics instruction and to be able to communicate effectively with groups of people. They needed a Nebraska teacher's certificate as a minimum requirement. It was necessary for the teachers to be fimiliar with all of the mathematics included in the VTPM program.

The typists were required to have at least two years of high school mathematics, and to be able to type 45 words per minute with no errors in a one-minute test. The bookkeeping-stenographer had to be familiar with the bookkeeping and reporting procedures in current use by the ESEA, Title III office.

A biographical sketch of the director and assistant director follows. They are the only two certified members of the project staff. The versatility of the two staff members is reflected in their sketches.

Russ Thompson is thirty-five years old. He graduated cum laude from Kearney State Teachers College, Kearney, Nebraska, in 1959. He has thirteen years of teaching experience (five in Arnold). He has forty-five college hours in mathematics, fifteen at the graduate level.

Albert Fuller is 49 years old and has an AB degree from the University of Omaha with a major in Psychology and minors in mathematics and physical science. He was mathematics and science teacher and principal of the high school at Arnold's Park, Iowa for three years, mathematics and science teacher and principal of the high school at Arnold, Nebraska for eight years, mathematics and science teacher and superintendent of Logan County High School for one year, and again mathematics and science teacher at Arnold High School for the past fifteen years. He has recently completed a course in electronics and TV repair at the Mid-Plains Technical College in North Platte, Nebraska so that he would be better able to operate the VTPM project equipment. Mr. Fuller has thirty hours graduate credit in administration and science.

Technical assistance and consultation was also received from: Dr. Clint Ludeman and Dr. Lynn Johnson of Kearney State College, Dr. Curtis Crandall, Lincoln Public Schools, Mary McManus, and Susan Peterson, E.S.E.A., Title III, Vid-A-Comm Corporation, Lincoln, Nebraska.

Instructional Material, Equipment, and Facilities

The present mathematics room was enlarged to include enough room for ten carrels and storage space for the video-tapes, packages, tests, production equipment, etc. The storage room was air-conditioned to protect the video-tapes. These facilities are located in the Arnold High School building and are wholly owned by the School District #89, (the LEA).

The major new materials and equipment purchased for the operation of the project are listed below:

2 video-tape recorders

5 video-tape playback units

6 student carrels

2 cameras

2 camera dollies

1 special effects generator

textbooks

tests

video-tape cassettes

The video-tape recorders, cameras, and video-tape cassettes were necessary to produce the instructional presentations that are the heart of the program.

The cassette format was chosen because of the desire to have the student play his own lesson without help. The cassette saves time and tape spoilage, gives a better picture, and requires less maintenance of

the playback systems.

The carrels and headsets were needed so that each student could study his instruction without interfering with the concentration of the remainder of the class.

The dolly and the special effects generator were necessary to move one of the cameras during production and to switch from one camera to the other during production.

The new textbooks were necessary to fit the new system better than the more conventional texts now in use.

The tests were for evaluation of the entire project and to verify the effect of the new program on the students.

Specific Performance Objectives of the Program

Two educational goals were established for the VTPM Program at Arnold for the 1972-73 school year. These were:

1. To increase the mathematical achievement of those students participating in the VTPM Program in Basic Math I and Algebra I.

2. To improve the attitude of the student towards mathematics by participating in the VTPM Program.

To satisfy these specific performance goals, the following objectives were realized as observed and verified by the evaluators:

1. Thirty-two students participated in the VTPM Program in Basic Math I and Algebra I.

2. 100% of the VTPM students negotiated a contract in cooperation with their parents and the mathematics teachers. Eight of the students or 25% of the total students were behind their agreed-to schedules at the end of the year, while ten students had completed their schedules on time. Fourteen students, or approximately 44% of the VTPM group finished ahead of schedule. Chart Number 1 illustrates the above.

3. 100% of the parents of the VTPM students actively participated in the development of a performance contract in mathematics with their child and the program mathematics teachers.

4. 100% of the parents of project students demonstrated acceptance of the VTPM program as evidenced by their signature on their child's performance contract.

5. By the end of the school year (1972-1973) the project staff had produced twenty-five video-taped packages for mathematics incorporating continuous progress methods and video-taped units of instruction.

6. By the completion of the school year (1972-1973) the project teachers had implemented at least twenty-five instructional packages in Basic Mathematics and Algebra I.

7. The local school administrators provided support for the project by securing the materials, equipment, and personnel time for the project.

CHART #1

Student Number	Original	Revised	Completed	Ahead	On	Behind
1	03-03		03-04	1		
2	03-05		03-05		X	
3	03-08		03-06			2
4	01-12		01-10			2
5	01-07		01-09	2		
6	03-03	03-02	03-02		X	
7	03-05	03-04	03-04		X	
8	03-10	03-06	03-06		X	
9	03-08	03-05	03-05		X	
10	01-12		03-03	3		
11	03-08		03-05			3
12	03-03		03-03		X	
13	03-08	03-05	03-05		X	
14	03-06		03-07	1		
15	01-12		03-02	2		
16	03-08		03-07			1
17	03-03		03-02			1
18	01-06		01-08	2		
19	03-03		03-04	1		
20	01-12	01-09	01-09		X	
21	01-05		01-06	1		
22	01-09	01-06	01-07	1		
23	01-06		01-07	1		
24	03-03	03-02	03-02		X	

	Original	Revised	Completed	Ahead	On	Behind
25	03-03		03-04	1		
26	01-12		01-09			3
27	01-06		01-07	1		
28	03-05		03-04			1
29	01-06		01-12	6		
30	01-06		01-07	1		
31	03-05		03-04			1
32	03-08		03-08		X	

8. The Superintendent of Schools demonstrated knowledge and understanding of the project by supporting the project staff in their efforts.

9. The community displayed interest in and support of the project as evidenced by an average attendance of seventy-eight community citizens at the fall and spring community meetings concerning the project.

10. By the end of the 1972-73 school year, the mathematics curriculum for grade nine was totally revised from group instruction, single textbook approach to a continuous progress package approach using instructional units that are based upon multiple texts and that use video-tapes in each unit as a primary instructional method.

11. By the end of the year modifications had been made in scheduling, physical facilities, and instructional practices of the mathematics program for ninth grade students so that:
    a. All mathematics was taught in a single mathematics center on an individualized basis.
    b. All mathematics was presented in small packages which were each worth one credit hour of high school math credit upon completion.
    c. No failing marks were given. Students either did nothing or succeeded.
    d. The principal method of instruction was video-taped instructional units with individual playback systems in carrels.
    e. After help from friends, textbooks, or video-tapes the teacher was a resource in the room.
    f. Performance contracts were negotiated between student, teacher, and parents.
    g. Students who failed to meet the terms of the contract or respond to the greater freedom in the V.T.P.M. classroom were placed in a special math class with a longer time to study math.
    h. Criterion tests at the end of each instructional unit and package tests at the end of each package evaluated the effectiveness of the instruction in each unit and package.

12. At the end of the first year, the following changes had been made in the teaching of ninth grade mathematics:
    a. The students had made use of the prepared packages which stated the goals and objectives in behavorial terms and which contained suggested activities, criterion tests, etc.
    b. Study carrels with video-tape playback systems had been available to the project students.
    c. Video-taped lessons on each behavorial objective in the entire course had been made available to the project students.
    d. New textbooks as well as supplementary materials had been made accessible to the project students.

13. The Arnold High School Principal had received and disbursed Title III and school district funds for the operation of the VTPM project as authorized by the Arnold school board.

14. The necessary administrative support for the project was supplied by the Superintendent of Schools as evidenced by his approval and/or assistance in securing materials, equipment, and personnel time for the project.

Management Objectives

1. At the end of the year, the project director had fulfilled his responsibility for observing the time requirements, hiring the needed personnel, presenting requests for materials, equipment, alterations, and other items of expense, and in directing the activities of the project and the staff.

2. The project Assistant Director had maintained the responsibility for the activities involving the Community Council, dissemination, correspondence, writing of the packages, the production of the video-tapes, and the maintenance of project equipment. Dissemination and community support activities are described below. Chart #2 indicates the operational channels for these activities.

The major dissemination activities included:

a. newspaper articles in the Arnold Sentinel, and the North Platte Telegraph.
b. a television presentation on Channel 2, North Platte.
c. progress reports at Community Council meetings.
d. the production of a slide-tape program as well as a video-tape presentation which explains the project.
e. an article in ESEA Title III Quarterly Report, Fall 1972, published by the Nebraska State Department of Education, which described the project.
f. an article on the project in ITV Recordings, November 1972.
g. the December 7, 1972 issue of NSEA News discussed the Arnold project.
h. a presentation by the project staff was given on December 24, 1972 to school administrators, media specialists, and State Department of Education Staff.
i. The Arnold Project was presented to the Nebraska School Principals' meeting in Grand Island on March 16, 1973.
j. a program given to the Arnold Rotary Club describing the highlights and accomplishments of the project.
k. a presentation regarding the project to a graduate class at Kearney State College.
l. a discussion of the project at an inservice meeting of faculty at Loup City.
m. a preparation of a brochure by the Nebraska State Department of Education explaining the VTPM project.
n. entertaining on-site visitors from other schools who are interested in the Arnold project.
o. a presentation to the Custer County Teachers' Association.
p. the attendance of the project staff at a Title III Educational Fair in Cheyenne, Wyoming. The staff made a presentation of the project, and also constructed a display format for the Fair.

Evidence of Community support included the following:

a. The Arnold Rotary Club donated volunteer help in assembling materials for the project.
b. Some aid was received from the Community Council members in recording test items.
c. High attendance at Community Council meetings was achieved.
d. The Arnold Rotary club constructed a display of the Arnold Project which was utilized at area and state meetings.
e. A Community Council member volunteered time to stain one of the newly added study carrels in the mathematics center.

Chart #2

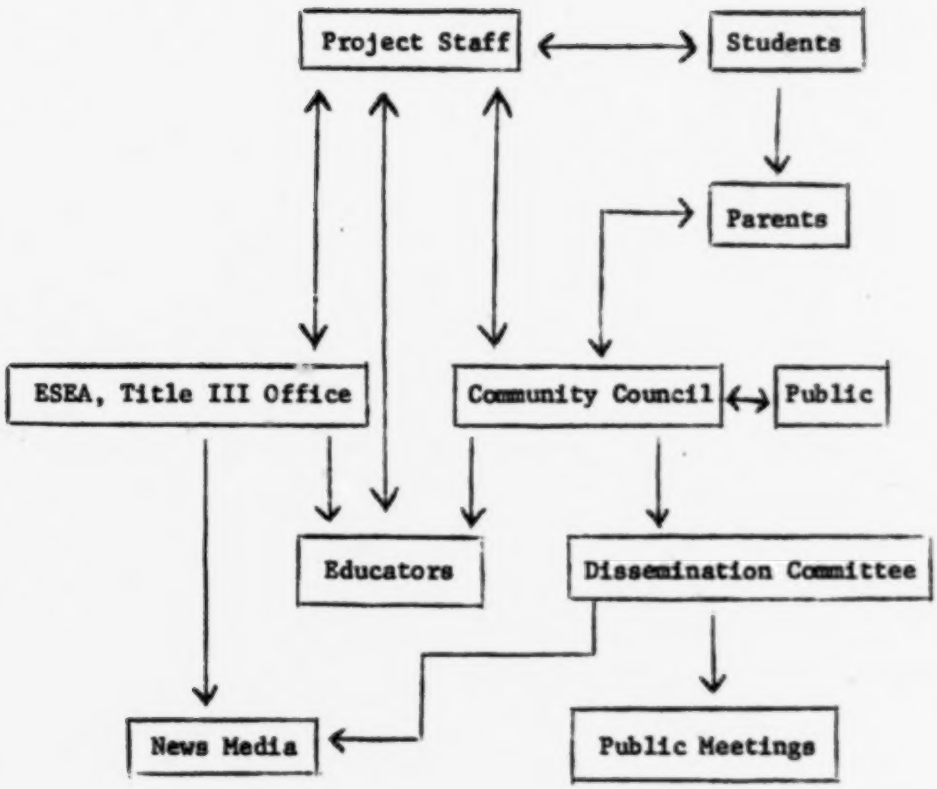


Chart Depicting Communications and Dissemination Channels

Budget

The source of the program funds was ESEA Title III ($34,841.00) and Arnold Public Schools ($2,104.00). The total cost of the program, June 1, 1972 to May 31, 1973 was $36,945. Of this amount, $10,027 was allocated for equipment necessary to operate the program. Also a sum of $1,375 was expended on remodeling in order to provide the needed facilities for the program. In terms of "start-up" costs, the total amount of the budget was approximately $11,400.00, or roughly thirty percent of the total costs of the program. This sum of money will not be necessary for the continuation of the program. Detailed breakdowns of the budget are found on Charts 3-6.

CHART NO. 3

BUDGET SUMMARY
June 1, 1972 to May 31, 1973

Expenditure Accounts	Expense Classification						
	Salaries		Contracted	Materials			
	Prof.	Non-prof.	Services	Supplies	Travel	Equipment	Total
Administration	1,200	600	4,529	348	600		7,277
Instruction	9,450	1,125		6,962			17,537
Fixed Charges	639	90					729
Remodeling			500	875			1,375
Capital Outlay						10,027	10,027
	11,289	1,815	5,029	8,185	600	10,027	

CHART NO. 4

SUPPLEMENTARY SCHEDULES — BUDGET SUMMARY

Administration

Expense class	Name and Title, Purpose or item	Project time: Full	Project time: Part	Quantity	Salary Rental	Amount
Salaries, Professional	Russ Thompson Director		X		@$6.30 per hr.	600
	Albert Fuller, Assistant Director		X		@$6.30 per hr.	600
Salaries, Non-Professional	Pauline Harberts Bookkeeping		X		@$3.00 per hr.	600
Contracted Services	Evaluation: Dr. Curtis Crandall, Dr. Clinton Ludeman, Dr. Lynn Johnson					3000
	Audit: Tom Hill				2% of budget	696
Materials & Supplies	Dissemination materials				1% of budget	348
Travel	Russ Thompson, trips to Lincoln, etc.					300
	Albert Fuller, trips to Lincoln, etc.					300
	Three persons to PNAC conference in Washington, DC					833
				Total Amount Budgeted		$7,277

CHART NO. 5

Expense Class	Name and Title, Purpose or item	Project time Full	Project time Part	Quantity	Salary Rental Cost	Amount Budgeted
Salaries, Professional	Russ Thompson, Curriculum developer		X		@$6.30	4,725
	Albert Fuller, Curriculum developer		X		@$6.30	4.725
Salaries, Non-professional	Miles Auble, typist		X		@$1.50	562
	Cynthia Peters, typist		X		@$1.50	563
Materials and Supplies	Paper					525
	Stencils					222
	Video-tapes					5,500
	Textbooks and programs					715
				Total Amount Budgeted		$17,537
	Fixed Charges					
Salaries (fringe benefits) Professional	Social Security 5.2%					364
	Teacher's Retirement					75
Non-professional	Social Security 5.2%					90
				Total Budget Amount		$729
	Remodeling					
Contracted Services	Quin Connely, Carpenter					250
	Rex McKain, Electrician					250
Materials and Supplies	Carpeting					750
	New Door					25
	Air-Conditioning					100
				Total Budget Amount		$1,375

CHART NO. 6

Capital Outlay (equipment only)

	Quantity	Unit Rental Cost per mo.	Project period cost	Unit Cost	Total Cost
VT Recorders	2			1350	2700
VT Playbacks	5			950	4750
VT Camera	1			695	695
VT Camera	1			350	350
Camera Dolly	1			50	50
Camera switcher	1			45	45
Study Carrels	6			108	650
Monitors	6			75	450
Monitor 19"	1			277	277
Head Sets	6			10	60
			Total Amount Budgeted		$10,027

The achievement of the preceeding objectives was monitored by the evaluator through monthly on-site observations, correspondence, telephone, analysis of minutes of community meetings, and student interviews. This information is on file in the quarterly reports and in separate documents at the project site.

1. Description of the Population Samples

Thirty-two ninth grade mathematics students were involved in the experimental program. These students were exposed to the individualized mathematics instruction supplemented by video-taped presentations prepared by the project director and assistant project director. Hereafter this group will be referred to as the treatment group or the experimental group.

Arnold, Nebraska, being a small farm community located in a sparsely populated area of the state, could not support a large student population for a comprehensive statistical evaluation. The thirty-two students mentioned above constituted the entire ninth grade mathematics population; therefore a control group from this same school class was not available.

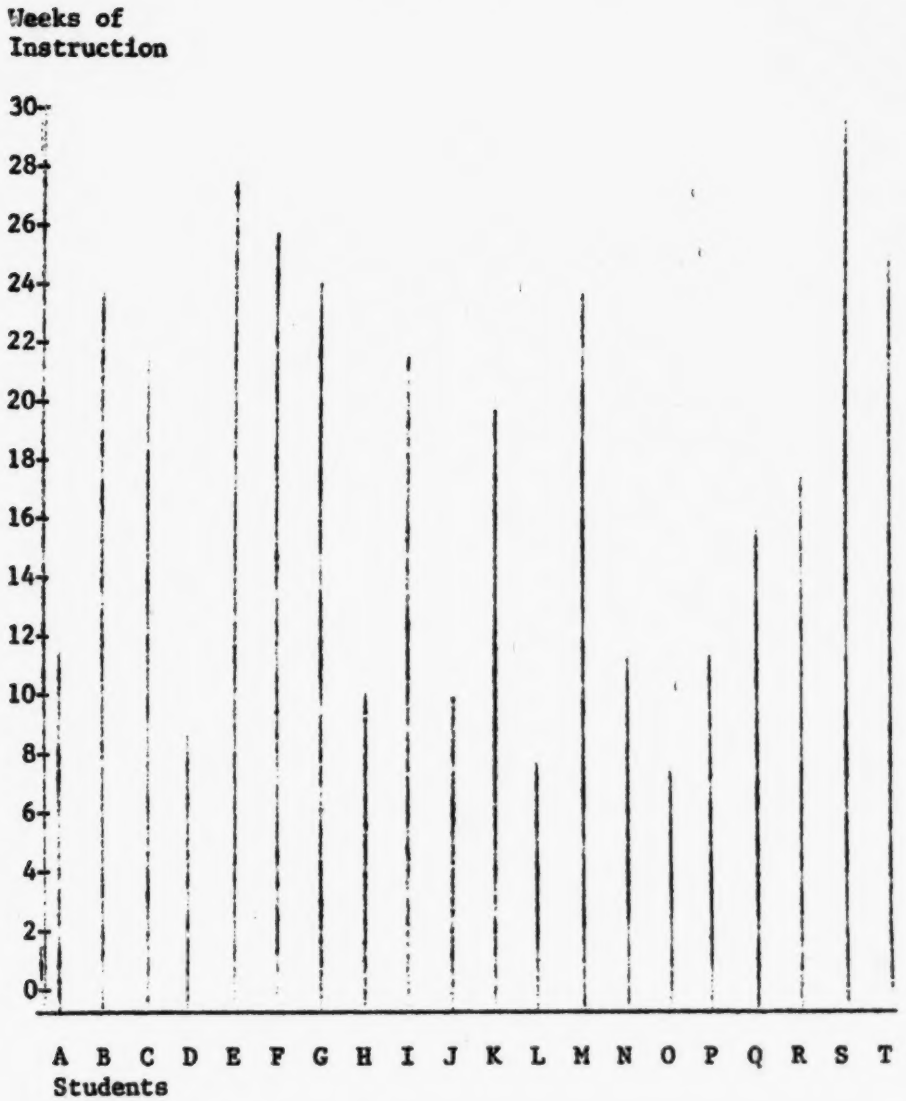
It was decided that a control group could be picked from the previous year's ninth grade group. The project staff had tested twenty-one ninth graders on April 28, 1972. These students had completed thirty-six weeks of elementary algebra and were designated the control group in algebra. Fifteen student in this 1972 ninth grade group studied basic mathematics rather than algebra. These fifteen students constitute the control group for basic mathematics.

The project staff had administered both a pre-test and a post-test to the basic mathematics groups. The pre-test was given in May 1971 for the control group and in May 1972 for the experimental group. Post-tests were administered in May 1972 and May 1973. Gain scores were calculated for all participants in basic mathematics control and experimental groups.

An explanation of the experimental groups mathematics program will now be given. Twelve students were designated as basic mathematics participants. These were the students who received thirty-six weeks of basic math instruction, the same number of week as the control group.

Twenty students were designated as Algebra I participants. All of the algebra participants also studied and completed the basic mathematics packages, but at a faster pace. These algebra students were in the process of completing algebra packages at the end of the school term 1972-72. This experimental algebra group had students completing as few as nine weeks of algebra instruction and as many as thirty weeks. The reader can note that the participants in the control group of algebra all completed thirty-six weeks of algebra instruction while the participants in the experimental group had completed fewer weeks of algebra instruction. "Weeks of instruction" rather than "packages of instruction" was used in the narrative so that comparisons between two differing programs of instruction could be made. The following table summarizes the weeks of instruction completed by the participants in the VTPM algebra program at the conclusion of the school term 1972-73.

TABLE 2



One can readily see that students in the experimental group of algebra completed fewer weeks of algebra instruction than did students in control group algebra, who all completed thirty-six weeks of algebra instruction. The students in the basic mathematics experimental group and in the control group all completed thirty-six weeks of instruction It will be assumed that they received equivalent mathematics instruction when evaluated at the conclusion of the school term.

2. Testing Instrument Employed

The project staff and the evaluators selected the following testing instruments. To evaluate attitudes of mathematics, students in the VTPM program the Mathematics Inventory published by Minnesota Test Publishers, St. Paul, Minnesota was used. This inventory is one of very few standardized instruments available to test individuals' attitudes towards mathematics. It consists of one-hundred-ten items to which the student responds either agree (A), uncertain (U), or disagree (D). The numerical value of A, U, or D varies from one to three for each item so that A may have a value of two in one item and three in another. The publishers report that the test-retest correlations of the attitude scores are .89 and .87 which is quite high.

The testing instruments that were used to measure mathematics achievement were standardized mathematics examinations. The Mathematics Test grades 7, 8, and 9, Form 1 published by Houghton Mifflin Company was used to test results in basic mathematics. The Lankton First-Year Algebra Test, published by Harcourt, Brace, and Jovanovich was used to evaluate the algebra students.

The rationale behind using these instruments was as follow: The mathematics teachers had tested previous year's mathematic's students using these instruments. The results of the 1971-72 ninth grade group were employed in establishing the control group in algebra. It was felt that the same tests should be employed in evaluating the experimental group. This would help to minimize the number of variables that might confound the results of this evaluation.

3. Evaluation Models Explained and Results Tabulated

To evaluate the objective concerning achievement gains in basic mathematics and in first year algebra, two evaluative models or procedures were employed. In order to measure whether 5-10 percentile points greater growth resulted from the experimental group as compared to the control group, it was decided to calculate the average raw scores from each group. This average was then converted to a percentile rank and comparisons were made on these calculations.

TABLE 3

Raw Score Average and Percentile Rank For Control And Experimental Group

	First-Year Algebra		
Group	Raw Score Average	Number in Group	Percentile Rank
Control	$\bar{X}$ = 26.90	21	74
Experimental	$\bar{X}$ = 26.05	20	74

From the results tabulated in Table 3 one can readily see that the two groups scored almost identical when comparing average test scores. A most interesting fact, however, must be pointed out regarding the achievement levels shown by the experimental group. None of the students had completed an equivalent of thirty-six weeks of algebra instruction as did the participants in the control group. They did in fact average 18.35 weeks of instruction, yet achieved at the same level in mathematics.

Table 4 shows the weeks of completed algebra instruction and raw scores in algebra by the experimental group.

TABLE 4

Raw Scores And Weeks Of Algebra Completed
By Students In Experimental Group

Student	Raw Score	Weeks of Completed Algebra
1	17	12
2	33	24
3	31	22
4	22	9
5	30	27
6	28	26
7	25	24
8	23	10
9	27	22
10	18	12
11	31	20
12	20	9
13	36	24
14	19	12
15	23	7
16	30	13
17	22	18
18	22	19
19	37	30
20	27	27

One can readily note that only ten students had completed twenty weeks of equivalent instruction and that only one student had reached an equivalent of thirty weeks of instruction. Yet, on the average, this group did as well as a group of algebra students all covering the mathematics in a thirty-six week algebra course.

When analyzing the results from the basic mathematics groups, again raw scores from each group were averaged and then their averages converted to percentile rankings. However, more data was available to help in the evaluation than was the case in the algebra groups. The project staff had tested the control group students prior to their taking a thirty-six week course of instruction in basic mathematics. Therefore the treatment group was tested prior to entry in the VTPM basic mathematics program and both groups were tested after completion or near completion of the course of instruction. The results are tabulated in table 5.

TABLE 5

Raw Score Average And Percentile Rank For Control And Experimental Groups

Basic Mathematics

Group	Raw Score Average Pre-test	Raw Score Average Post-test	Number in Group	Percentile Rank Pre-test	Percentile Rank Post-test
Control	$\bar{X}$ = 47.90	$\bar{X}$ = 46.20	15	25	20
Experimental	$\bar{X}$ = 43.83	$\bar{X}$ = 46.17	12	15	20

One can readily note that the control group's average score dropped from 47.90 to 46.20 while the experimental group's average increased from 43.83 to 46.17. In terms of percentile ranks the control group decreased five percentile points during the period of instruction while the experimental group increased approximately five percentile points.

Besides the analysis previously given, the evaluators added an evaluation design not originally required in the project objectives. It was felt that more information regarding the test results of students in the program would be beneficial in the evaluation. The following is a discription of these evaluation designs and the results obtained.

The raw scores of students test results in algebra and basic mathematics were analyzed and compared by a statistical model referred to as the t-distribution. It is used to determine if the means of the samples differed significantly. Its corresponding test, called the t-test, assumes that the distribution of variables in the tested populations is normal and that these populations possess equal variance. These assumptions were made regarding the populations tested since these were students from the same rural area and attended the same school as ninth graders. Also the mathematics staff was constant for both groups and in most cases the students had identical elementary backgrounds. There were no reasons to believe that outside variables, other than the method of mathematical instruction, could offset the performance in mathematics. The evaluators also chose to ignore intelligence as a possible confounding variable because the I. Q. scores from control and experimental groups were quite comparable and to control this variable would have been too cumbersome.

Table 7 summarizes the results of the calculating done to compute the t-statistics for the first year algebra control and experimental groups. The reader may consult any basic statistics book for the calculation formulas in computing the t-statistics. Computer facilities were used to calculate all t-test information that follows.

TABLE 7

Data Necessary for Calculating the t-Statistics for Students First-Year Algebra, Control and Experimental Groups.

Variable	Control	Experimental
Mean Algebra Score	26.90	26.05
Variance	49.13	32.74
Number	21	20

With thirty-nine degrees of freedom the t-statistic calculated was 0.429. When consulting a table for critical values of t, it was noted that for thirty-nine degrees of freedom a value of t = 2.021 was needed for significance at the .05 level of confidence. Since 2.021 is much larger than 0.429 we are safe to assume that there is no significant difference in achievement by students exposed to the treatment than those students enrolled in the traditional algebra program. We again must note that students in the experimental group did not complete as much algebra instruction as those in the control group.

The evaluators felt that it would be beneficial to see if the number of weeks of instruction within the experimental group had any effect on the performance on the algebra standardized examination. Ten students had completed twenty weeks or more of mathematics packages and ten students had completed less than twenty weeks. Did the number of weeks of instruction offset performance on the examination? If it did, then we would be safe to assume that if the experimental group had been tested after they had completed all of the VTPM packages in algebra then the mean scores would be substantially higher. Table 8 summarizes the results of computer calculations done to compute the t-statistic within the experimental group.

TABLE 8

Data Necessary For Calculating the t-statistics For Students Completing Twenty Or More Weeks Of Algebra Instruction With Those Students Completing Less Than Twenty Weeks of Instruction.

Variable	Twenty Weeks or More	Less Than Twenty Weeks
Mean Algebra Score	30.70	21.60
Variable	13.01	11.84
Number	10	10

The calculated t-statistic with eighteen degrees of freedom was 5.77. At the 95 percent confidence limits the necessary value for significance is 2.101 which is far below the calculated value. Therefore we would be safe to assume that in 95 out of 100 cases tested the more weeks of material completed, the higher the average score on the achievement test.

The next comparisons that would logically follow would be to compare the above twenty week group with the entire control group. This might help answer the question "would the better or more proficient mathematics students from the experimental group compare favorable with all students completing thirty-six weeks of mathematics instruction?" Table 9 summarizes the calculations needed to compute the t-statistic necessary for this calculation.

TABLE 9

Data Necessary For Calculating The t-statistic For Students From The experimental Group Completing Twenty Or More Weeks of Instruction With The Control Group.

Variable	Twenty or More Weeks of Instruction	Control Group
Mean Algebra Score	30.50	26.90
Variance	14.05	49.13
Number	10	21

One will note that the mean score from the experimental group was about four points higher than the mean score from the control group. This difference, although pronounced, was not large enough to be statistically significant. With twenty-nine degrees of freedom and at the 95 percent confidence limits the value of t for significance is 2.045 or higher. From this data the t-statistic is 1.858 which is too small to say that the difference in mean scores is significant.

The anslysis of the basic mathematics students was done in much the same manner as was with the algebra students; the difference in anslysis would be to statistically test gained scores in mathematics instruction rather than raw scores. The reader will recall that the analysis of gained scores was made earlier but with a different model. The mean gained scores from the control group was $\overline{X} = -1.667$ while the mean gained score from the experimental group was $X = 2.333$. When the question as to whether the difference between the mean scores was significant, we again make reference to the t-distribution. For twenty-two degrees of freedom and at the 95 percent confidence limit the significant value of t is 2.074. The calculated t value in this analysis was 1.580 which is less than 2.074.

Hence the difference, which favors the experimental group, is not statistically significant and we would be forced to assume that there is no statistically significant difference between the mean scores.

Summary of the Findings of Evaluation of Achievement Gains in Algebra and Basic Mathematics.

The objective as written by the project staff and evaluators was that students studying mathematics from the VTPM program would achieve 5-10 percentile points greater growth than those students studying mathematics from a traditional classroom setting. When ninth graders in 1971-72 school term (control group) were compared with ninth graders in the 1972-73 school term (experimental group), the following results were noted. When comparing average test scores, students in the experimental group scored equally well with the students in the control group. This fact is quite interesting because the experimental group had no students completing thirty-six week of algebra instruction as did all students in the control group. In fact, when those students that completed more than twenty weeks instruction were compared with the entire control group their mean score was substantially higher (30.5 compared with 26.9). In terms of percentiles this amounts to a nine percentile gain by students in the VTPM program. The evaluators questioned what the results would be if all students in the experimental group were tested after completion of all algebra units of instruction. It would seem that this gain would maintain this level or be greater if the groups were compared on equal amounts of mathematics instruction. In terms of mathematics achievement, the VTPM concept was quite beneficial.

The statistical evaluation made by the evaluators did not add any

meaningful interpretations to the before mentioned evaluation. Although the statistical analysis was not a part of the original evealuation design, it was decided to add this portion of the evaluation to this report. To summarize, the t-distribution and its corresponding t-test did not yield any statistically significant differences between the mean raw scores in first year algebra. When the experimental group was divided into two subgroups, according to amount of mathematics packages completed, the evaluators found significant differences in achievement gains as measured by the Lankton First Year Algebra Test. The interpretations of this result would make one assume that the more packages completed, the better students would perform on the standardized examination. Again this conclusion would lead one to assume that after the experimental group finished the entire VTPM packages their mean scores would increase substantially and perhaps the statistical evaluation would further support the VTPM program.

The basic mathematics groups were next analyzed. The control group basic mathematics students actually digressed five percentile points in a year's time while the experimental group accomplished the goal set by the project staff. The basic mathematics VTPM students showed a growth of five percentile points in their achievement although when compared with the control group they ended the year at the same level. Table 5 shows that the pre-test scores were quite different: They were ten percentile points apart prior to exposure to basic mathematics instruction. At the end of the school term they were, on the average, at an equal status. The VTPM students clearly showed greater growth in mathematical competency.

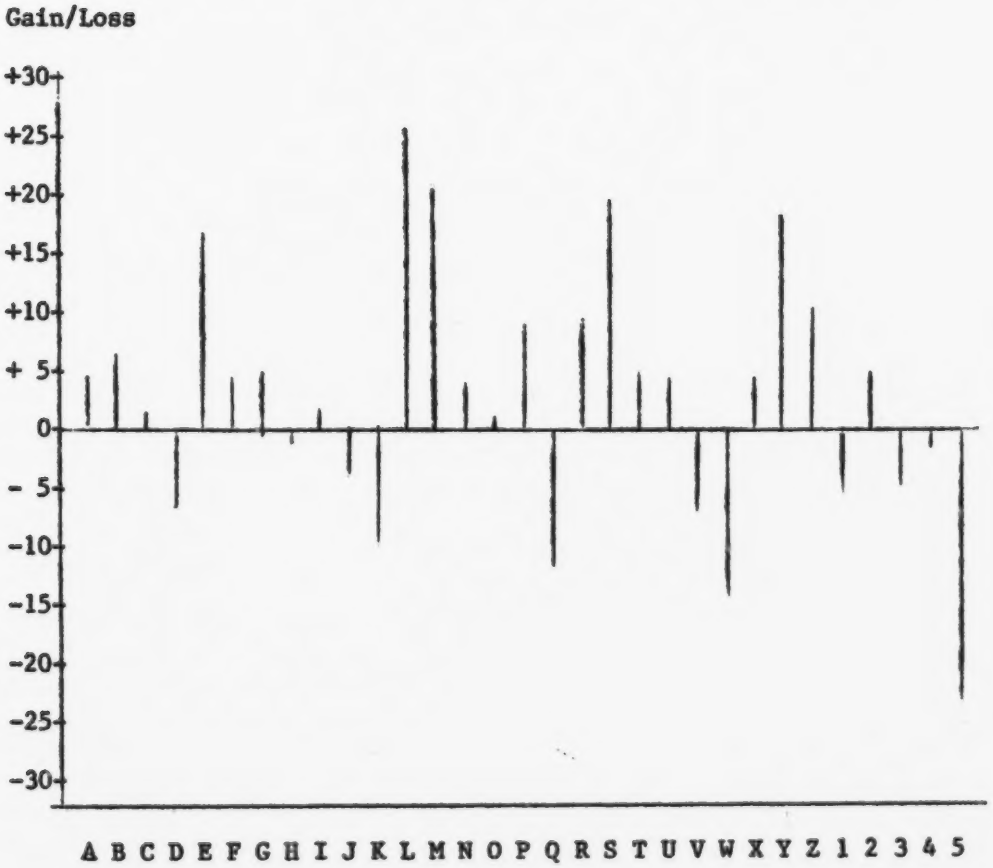
When analyzing the statistical evaluation of basic mathematics results we again found that mean gained scores from the experimental group were higher than those in the control group. However, when the t-distribution was applied to basic groups the differences were not statistically significant.

Analysis of Attitudinal Survey

All ninth grade mathematics students were administered the Mathematics Inventory to test their attitudes towards mathematics. The students in this analysis were grouped together regardless of their mathematics study. The attitudinal instrument was administered in September, 1972 as a pre-test instrument and again in May, 1973 as a post-test evaluation. Gained scores were tabulated for each VTPM student; the results are pictured in Table 10.

TABLE 10

Students in VTPM program and their corresponding
Gained Scores as measured by Mathematics Inventory



The evaluators calculated the average gain score per student studying algebra and basic mathematics via VTPM program. Sixty-five percent of the VTPM students showed a more positive attitude towards mathematics after one year exposure to the VTPM program. According to the objective written by the project staff and the evaluators, the VTPM program met the challenge posed to it. The original objective called for fifty percent of the VTPM students to show a gain in attitude toward mathematics. The evaluation far exceeded that original goal. Students seemed to respond quite favorably to the VTPM mathematics program.

Listed below is a summary of the individual responses to the inventory items. There were three choices, agree (A), undecided (U), or disagree (D) for the students to record.

TABLE 11

Pre-test and Post-test total for Mathematics Inventory Analysis

Question	Pre-test A	Pre-test U	Pre-test D	Post-test A	Post-test U	Post-test D
1. I would like to take mathematics even if it were not required.	17	12	2	22	9	2
2. Mathematics would be all right if we didn't have tests.	8	10	13	3	9	21
3. There is a lot of fun in mathematics trying to get the right answer.	10	11	10	21	7	5
4. I don't care whether I understand how to do a problem as long as I can get the right answer.	4	1	26	2	3	28
5. I like to explain how to do mathematics questions to other people.	10	4	17	18	8	7
6. I like mathematics because you can figure things out instead of memorizing.	20	7	4	21	4	8

TABLE 11 continued

Question	Pre-test A	Pre-test U	Pre-test D	Post-test A	Post-test U	Post-test D
7. I sometimes work problems that were not assigned just for the fun of it.	12	3	16	21	2	10
8. I like to do mathematics problems because it is like doing puzzles.	17	5	9	11	12	10
9. I like mathematics because it makes you think a lot.	11	14	6	15	7	11
10. I will be glad when I am finished with mathematics.	12	13	6	19	12	2
11. I like mathematics even though I don't make good marks in it.	16	6	9	20	6	7
12. If I don't see how to get a problem right off, I never get it.	5	6	20	0	7	26
13. I use things I learned in mathematics class outside of school.	29	1	1	28	3	2
14. I get nervous when the teacher asks me a question.	12	7	12	17	5	11
15. When we go on to something new, I usually forget what we have done before.	12	4	15	7	10	16
16. Mathematics is fun because there are so many things you can find out for yourself.	11	11	9	25	5	3
17. Mathematics is the most important subject we take in school.	15	12	4	13	16	4
18. Mathematics assignments are usually more work than those of other subjects.	15	6	10	11	9	13
19. I would like to read something about mathematics besides what is in our textbook.	7	16	8	7	16	10
20. If I were a teacher, I would like to teach mathematics.	5	5	21	12	6	15
21. I like to do a lot of problems of the same kind rather than have different kinds all mixed up.	26	2	3	17	10	6

TABLE 11 continued

Question	Pre-test A	Pre-test U	Pre-test D	Post-test A	Post-test U	Post-test D
22. I have told the class about something that I saw or read that had to do with mathematics.	1	2	28	2	2	29
23. It's easier to pay attention in some of my other classes than it is in mathematics.	14	4	13	15	5	13
24. I would be interested in taking other subjects that make use of mathematics.	9	15	7	14	12	7
25. Mathematics is one of my favorite subjects.	17	6	8	17	8	8
26. I don't try as hard as I should in mathematics.	16	8	7	26	4	3
27. We shouldn't have questions on tests about things we haven't covered in class.	24	3	4	26	4	3
28. Whether I like mathematics or not depends on the teacher.	11	3	17	9	8	16
29. Mathematics helps me in some of my other subjects.	25	2	4	32	1	0
30. Our teacher makes mathematics interesting.	27	3	1	25	6	2
31. I have a hobby which uses some mathematics.	15	4	12	8	1	24
32. I would like to see one of the electronic brains in action.	24	5	2	27	2	4
33. I would do better in mathematics if it were more interesting.	15	14	2	9	19	5
34. I wish there were more hard problems to work.	1	2	28	1	9	23
35. I like mathematics because the answer is either right or wrong.	17	10	4	19	10	4
36. Mathematics is boring; we do the same thing over and over again.	2	7	22	1	6	26
37. I don't see why we have to take mathematics anyway.	0	4	27	1	4	28

TABLE 11 continued

Question	Pre-test A	Pre-test U	Pre-test D	Post-test A	Post-test U	Post-test D
38. Anything with numbers in it upsets me.	1	2	28	1	3	29
39. I don't think mathematics is useful outside of school.	0	0	31	0	1	32
40. I worry a lot about how I am going to do on my next mathematics test.	23	4	4	21	5	7
41. Mathematics leads to neat, orderly thinking.	19	12	0	19	13	1
42. I don't like to do mathematics because you have to think too much.	0	12	19	4	9	20
43. Mathematics would be more fun if there weren't so many problems to do.	8	16	7	10	14	9
44. I always try to hand in my assignments on time.	30	0	1	30	2	1
45. I try to work more problems than are assigned in class.	2	8	21	14	3	16
46. I would rather get high marks in mathematics than in any other subject.	13	13	5	11	17	5
47. I don't see much connection between mathematics and my other subjects.	7	6	18	2	7	25
48. The harder problems are the better I like to try them.	5	9	17	4	10	19
49. I like to try to solve mathematics problems that have tricks in them.	8	7	16	9	7	17
50. Mathematics is one of my best subjects.	9	5	17	12	7	14
51. It is more important for people to know mathematics nowadays than it was in olden times.	28	3	0	29	4	0
52. I think everyone should take a lot of mathematics in school.	15	9	7	13	12	8
53. You wouldn't have to know much about mathematics to build a house.	4	2	25	1	3	29

TABLE 11 continued

Question	Pre-test A	Pre-test U	Pre-test D	Post-test A	Post-test U	Post-test D
54. The rules in mathematics don't make sense.	3	8	20	1	6	26
55. There is more to mathematics than just getting the right answer.	29	1	1	32	1	0
56. Mathematics is a practical subject.	20	9	2	22	7	4
57. We should be marked on how hard we try rather than on how much we get right.	12	11	8	8	16	9
58. I never know what to do when I start an assignment.	3	8	20	3	8	23
59. I don't like to do old stuff that we did last year.	4	5	22	6	13	14
60. Working mathematics problems is fun.	12	9	10	13	12	8
61. When I grow up I would like to have a job where I would use mathematics a great deal.	8	8	15	5	15	13
62. I don't feel I have had good teaching in earlier grades.	7	7	17	7	11	15
63. I would be interested in buying a machine that would do all my problems for me.	12	10	9	11	11	11
64. I would be interested in staying once a month for a club where we would work puzzles with mathematics in them.	3	12	16	3	16	14
65. Our teacher likes to teach us mathematics.	21	9	1	26	6	1
66. We don't waste any time in mathematics class.	14	6	11	3	4	26
67. I look forward to mathematics class.	13	11	7	18	8	5
68. A person should always check his work.	31	0	0	29	3	1
69. I like to work problems in my head.	10	8	13	20	5	8
70. I like mathematics even though I make higher grades in other subjects.	16	9	6	24	5	4

TABLE 11 continued

Question	Pre-test A	Pre-test U	Pre-test D	Post-test A	Post-test U	Post-test D
71. I don't like anything about mathematics.	2	5	24	1	4	29
72. There are too many hard questions and not enough easy ones in our book.	3	15	13	8	12	13
73. I don't mind having to think hard before I get the right answer to a tough question.	18	8	5	22	6	5
74. I hope we have a different mathematics teacher next year.	3	3	25	1	5	27
75. It isn't how many you get done but how many you get right that is important.	23	6	2	29	4	0
76. School would be all right if it weren't for mathematics.	5	4	22	0	5	28
77. I would rather be a scientist than an author.	11	6	14	8	7	18
78. Guessing is important in getting good marks in mathematics.	3	2	26	0	7	25
79. There are too many rules to remember in mathematics.	11	11	9	11	14	8
80. I seem to forget a lot from one year to the next.	18	8	5	24	6	3
81. I only do my mathematics because I have to.	6	10	15	8	10	15
82. I think you should get part credit for working by the right method even if you don't get the right answer.	17	6	8	18	9	6
83. I sometimes work out puzzles for relaxation.	9	2	20	12	1	20
84. I like to be able to check my own work to see whether I am right.	23	5	3	27	6	0
85. I would rather read a book than do mathematics problems.	18	7	6	17	10	6
86. I like to see what makes things work like the insides of a clock.	16	7	8	20	6	7

TABLE 11 continued

Question	Pre-test A	Pre-test U	Pre-test D	Post-test A	Post-test U	Post-test D
87. A person should be able to explain how he got his answer to a mathematics problem.	23	7	1	29	3	1
88. Our textbook has a lot of interesting pictures and diagrams in it.	11	16	4	15	5	13
89. We never have any fun in mathematics class.	2	1	28	0	1	32
90. My friends and I sometimes play games that use numbers.	16	3	12	20	6	7
91. It isn't the marks you make but how much you have learned that is important.	26	3	2	31	2	0
92. Most work problems are fun to do.	10	11	10	16	11	6
93. I always count my change in a store.	13	4	14	17	4	12
94. I always know what the teacher is talking about in mathematics class.	4	5	22	3	2	28
95. I would like to keep my mathematics book after the year is over.	9	15	7	14	8	11
96. I often find shortcuts for doing questions that the teacher thinks are good.	8	11	12	10	9	14
97. Getting one hard problem is more satisfying than doing a whole page of easy ones.	17	7	7	23	7	3
98. It doesn't matter whether you get exactly the right answer as long as you are pretty close.	1	3	27	1	2	30
99. Mathematics is too cut and dried; there is no room for argument.	3	8	20	3	13	17
100. Some parts of mathematics are all right, but most of it I don't like.	8	10	13	6	13	14
101. Mathematics periods are too long.	5	8	18	2	8	23
102. I find it hard to listen to the teacher when he is teaching mathematics.	7	12	12	10	9	14

TABLE 11 continued

Question	Pre-test A	Pre-test U	Pre-test D	Post-test A	Post-test U	Post-test D
103. I often look ahead in our mathematics book to see what is coming next.	18	2	11	23	3	7
104. I don't like mathematics even though I make good marks in it.	4	7	19	3	10	20
105. Mathematics is all work and no play.	8	7	16	3	8	22
106. I don't plan on taking any more mathematics than I have to.	5	14	12	11	11	11
107. Our family sometimes plays games that use numbers.	10	2	19	13	3	17
108. My parents think mathematics is an important subject.	25	3	3	28	3	2
109. Mathematics is easy for me.	5	7	19	3	13	17
110. Most mathematics problems are too much work.	8	13	10	6	13	14

This evaluation will not consider a detailed item by item analysis; however the reader might note that attitudes towards mathematics remained the same or showed a trend towards a more positive feeling. Students tended to feel that mathematics is challenging; they enjoy explaining mathematics to other people and find problem solving to be both rewarding and intriguing when one can independently solve problems. More students found that after exposure to VTPM program, they would be more likely to work problems that were not assigned just for the fun of it and they also felt more likely that there is a transfer of mathematics learning to other subjects taken in school. Item 75 relates quite directly to this project. Most students felt that "it isn't how many problems you get done but how many you get right that is important" is their basic philosophy towards mathematics learning. This fits the philosophy of the VTPM program.

Changes in negative attitudes towards mathematics did not show any meaningful patterns. The results of the attitudinal survey would indicate a definite positive feeling towards the study of mathematics.

RECOMMENDATIONS

1. The project staff is to be commended for the professional attitude exhibited in the planning, implementation, and evaluation of their mathematics program. Due to this professional atmosphere permeating the entire Arnold Project, it is the opinion of the evaluators that this project should be continued. Seldom does the total community support educational experimentation and curriculum revision to the extent that Arnold has in this project.

2. The evaluators suggest the further development of curriculum materials in academic disciplines other than mathematics. The Arnold Public Schools possess the framework and expertise to expand the concept of the VTPM program in the total school setting.

3. The evaluators suggest that the program's dissemination activities be continued and broadened so as to involve school districts in the area surrounding Arnold and/or other areas of the state.

4. The evaluators suggest the continued monitoring of student attitudes towards the VTPM approach. Results from personal interviews and students and from the attitudional survey indicate a quite positive reaction to the program. It is the hope of the staff and evaluators that this attitude will continue after its "newness" subsides.

5. The evaluators suggest that the project staff continue to attend production seminars in an effort to futher strengthen their production skills. Improvement of production competencies was noted during the course of the production year. Futher improvements would be hopeful; this is not to say that they are needed in any specific area. The evaluators suggest that color television production be investigated for future implementation.

6. The evaluators suggest that any school district wishing to implement this model of classroom instruction first contact the Arnold project staff for consultant assistance. This staff has exhibited excellent management practices, sound engineering techniques in production of tapes, and professional expertise in creating the completed packages of mathematics packages on the schedule decided upon at the outset of the project.

7. The evaluators recommend that continued involvement by parental groups in the project; this would include the negotiations of student contracts and participations of parts in feedback sessions deemed necessary by parents and school officials. Parents have demonstrated interest in the project by their countless hours of donated assistance and supportive services to the project staff.

8. The evaluators recommend that the behavorial objectives written for the individualized packets be written to conform to a more standard format. The evaluators recommend that the staff follow a format outlined in Preparing Instructional Objectives by Robert Mager, who is considered an expert in this endeavor.

9. The evaluators recommend that more structure and time limitations be written into student contracts in an attempt to secure more beneficial use of student time.

Priorities and Needs

In order to apply for a Title III grant for educational purposes it is necessary that an assessment of our school's present priorities and needs be made. In order to accomplish this, various methods are employed including sampling groups of students, faculty, and persons not connected with the school. One way to find out what our priorities are is to see what we are doing best and assume that we give those activities high priority. On the other hand we could assume that the things that we are doing poorly or not at all and that we think we should be doing are our areas of greatest need. With that in mind would you please list five areas of which you consider Arnold High School to have the most need for improvement. Remember, our priorities are the way we are spending our time, effort, and money now; our needs are the way we think they ought to be spent. You may want to list specific subjects, such as science or math, or you may want to list broad areas such as citizenship or personal development. We would like to have the answers specific enough however that we can say, when we get through with the survey, these things are our priorities, but these things are our needs. Of course, if our priorities happen to be meeting our needs then this would be the ideal situation, and there would be no reason to carry out any new project.

I believe Arnold's priorities as of now are:

1. _____

2. _____

3. _____

4. _____

5. _____

I think five of the needs of our school at present are:

1. _____

2. _____

3. _____

4. _____

5. _____

Comments:

REGION REPORT OF AVERAGE SCORES

WEBB. STATEWIDE

	READING				LANGUAGE ARTS						
	COMPOSITE	COMPRE-HENSION	VOCABU-LARY	TOTAL	USAGE	SPELL-ING	TOTAL	MATH	SOCIAL STUDIES	SCIENCE	USE OF SOURCES
GRADE 9 AVERAGES W FOR AVG.		FIELD C AVG.		43.2	N -	298		FIELD D AVG.	103.9	N - 168	
STUDENT NORM PCTL	74	73	63	73	68	68	68	73	59	62	67

ARNOLD PUBLIC SCHOOL

STUDENT NORM PCTL	68	73	69	73	73	61	68	69	52	62	53

SRA ASSESSMENT SURVEY--IOWA TESTS OF EDUCATIONAL DEVELOPMENT

Appendix II

Internal Evaluation

The foregoing evaluation is the evaluation which was conducted by the external evaluators. In addition, the VTPM staff would like to present an internal evaluation of the project. It is largely subjective, but no one knows what happened during the first year of operation better than the VTPM teacher.

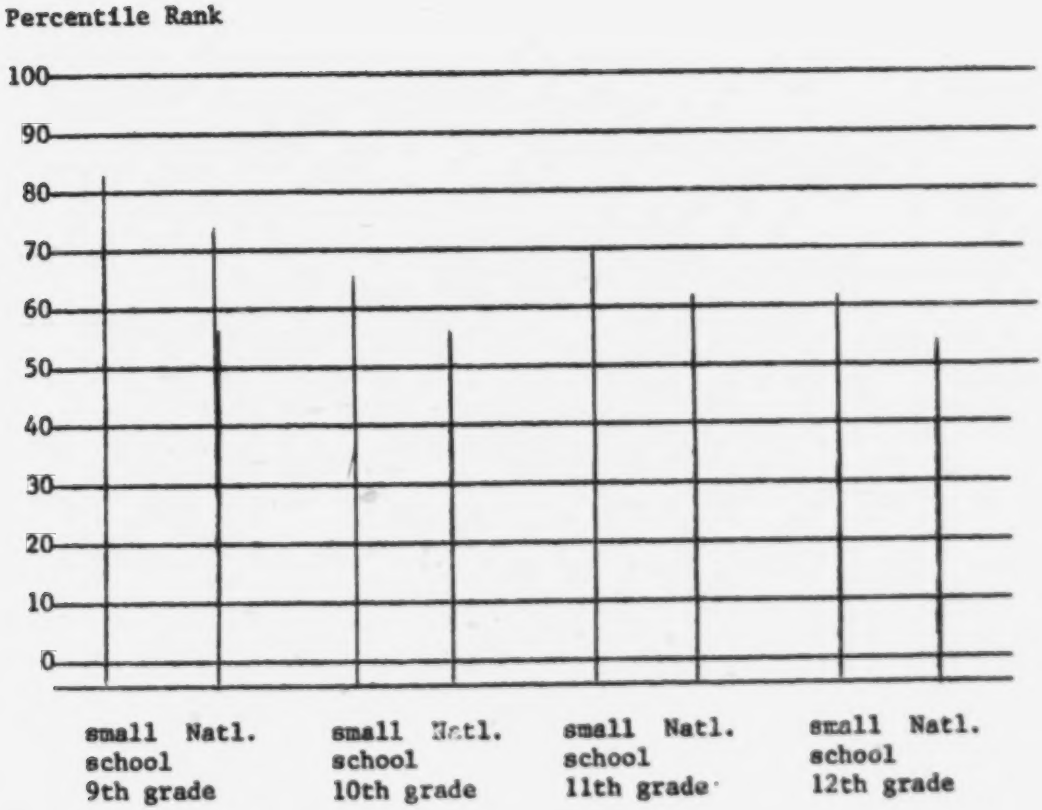
While we may tend to be prejudiced it is also true that there is no one more interested in having the VTPM system succeed. We therefore feel that our own observations and conslusions might be of interest.

On April 12, 1973, the guidance counselor at Arnold High School, Mr. Richard Bassett administered the mathematics section of the ITED tests to all four of the high school classes.

S.R.A. has a special small school set of norms, as well as national norms. The group averages for the four high school grades can be seen in Chart I.

The students in all grades (9 through 12) have come from the same community, had the same mathematics teachers, are similar in ability, and in many cases actually come from the same families. The 9th grade was exposed to the VTPM system for eight months before taking the test. They achieved a group average at the 82nd percentile on the small school norms, and at the 75th percentile on the national norms. These figures alone would indicate far above average achievement, yet the intelligence of this class is no more than average. The average of the other three classes in the high school was 66.6 percentile on the small school norm and 55.1 percentile on the national norm.

CHART I



This is a 15 point difference on the small school norm and a 20 point difference on the national norms.

We believe that the difference is due to the VTPM program which the ninth grade used.

Further testing of the same kind for the next three years should verify or contradict that belief.

We are not completely satisfied with three aspects of the system.

First the freedom to talk at will resulted in much wasted time and occasionally a noise level that was too high. We plan to conduct the math classroom more like a conventional study hall next year. A student must ask for permission to talk before he helps someone or asks for help. Otherwise he is to maintain conventional classroom order.

The answers to the attitude scale administered at the end of the 1972-73 school year show that the students themselves feel that they waste too much time in mathematics class.

Second, we are not satisfied with the motivation-particularly of the average student. We have changed the system so that a student may earn a "free day" by being ahead of his contracted schedule or may be required to spend an extra period in math class if he falls behind schedule. Other motivational schemes are being considered and will probably be implemented later if necessary.

Third, the behavioral objectives which we write for each instructional unit are not completely satisfactory to our outside evaluators.

The VTPM curriculum developers, prior to the start of the project, participated in a programmed workshop in "Designing Effective Instruction." This course had a strong influence on the organization of the Packages, Instructional Units, Criterion Tests, and Package Tests, that we developed for the VTPM system. We have been following the format for writing behavioral objectives as described in that workshop and in the workbook which accompanies it. In the future we intend to conform, as much as possible, to Mager's format. However, at present, we feel that complete conformity would require a reorganization of the instructional units, criterion tests, packages and package tests.

Our delema is that we feel that this organization is one of the strong points of the project, but we want to conform to our evaluator's suggestion's too. As a result we expect to develop some type of compromise between our present system of objective writing and the one recommended by our evaluators.

Finally, and perhaps most important, the original reason for undertaking the project was because the state wide assesment conducted in the fall of 1970 indicated that the Nebraska State side average for ninth grade students on the math section of the ITED test was the same raw score that represented the 73 percentile on the National Norms. The Arnold 9th graders were at the 69th percentile on that test. (See page 55 of this report.)

"We therefore selected high school mathematics as our area of concentration, and developing a plan for a program which will raise the class norm to the average for the State of Nebraska as our objective." Quoted from Planning Proposal, page 20.

Since the ninth grade students in the 1972-73 school year scored at the 75th percentile on the math section of the ITED test, the VTPM project exceeded the original goal as expressed in the planning proposal. And although we are not measuring the gain in each individual student, there was a 6 percentile point gain in achievement between the class which originally launched the project and the first class of project students.

Although this is not the achievement objective stated for the first year of the operational proposal, it <u>is</u> the achievement objective stated in the original planning proposal.